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A GUIDE TO THE STUDY OF SOLID WASTE SYSTEMS

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Rockville, Maryland

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A GUIDE TO THE STUDY OF SOLID WASTE SYSTEMS

A Division of Technical Operations
Open-File Report (TO 1.1.065/0)
written by
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Solid Waste Management Office
1971

I

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GUIDE TO EVALUATING SOLID WASTE SYSTEMS

The problem of collecting and disposing of solid waste (i.e. refuse) is one of the most pressing issues of the day. It is reported that the average community spends about $5.39 per person each year to collect the unwanted articles that have been discarded. The same community will also spend an average of $1.42 per person per year to dispose of this waste by methods that, for the most part, are inadequate.* Many communities spend much more than these average figures, of course, and many spend much less. Unfortunately, the spending of large sums of money does not guarantee that collection and disposal systems will operate efficiently and free of problems.

Even systems that are now looked on as being "good" or "adequate" will encounter periods of difficulty in the future. With the continued growth of the economy, the amounts of waste will rise and increase, causing system overloads and a rise in the cost of operating solid waste systems. More stringent regulations on air and water pollution will require an upgrading of disposal practices, and this will further increase costs.

The administrator of a solid waste system must then find a means of obtaining additional money for improvements without sacrificing the quality of service already provided. There are various means of raising funds for building and operating the components of a solid waste system, but basically the burden falls upon the people who are receiving the service, either through user charges or higher taxes.

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*Black, R. J., A. J. Muhich, A. J. Klee, H. L. Hickman, and R. D. Vaughan. The national solid wastes survey; an interim report. [Cincinnati], U.S. Department of Health, Education, and Welfare, [1968]. 53 p.

Before making a decision to raise the additional money, the administrator should thoroughly evaluate all aspects of the present operation. Often significant savings can be made, or service improved without additional expense, by locating and eliminating inefficient and unsatisfactory practices. Most administrators, however, do not have the time or the necessary objectivity to adequately evaluate their own systems. For this reason many of them hire consultants, either engineering or management, to investigate present operations and to recommend improvements.

Operating under the belief that the administration of a solid waste system cannot be separated from the operation of its components, the Bureau of Solid Waste Management has assisted in the evaluation of a number of systems using a combined engineering-management approach. This paper is intended as a guide to be used by those charged with evaluating solid waste systems and as a report on the present "state-of-the-art" of engineering-management studies of such systems. It is hoped that some of the principles contained herein might be utilized by others doing similar work outside of the Bureau so that the "art" might progress more quickly in becoming a "science".

Solid waste management can logically be considered to consist of two separate systems: physical handling of the waste; and administrative and financial management of people and equipment. Before undertaking the study of any solid waste agency, the consultant will usually have some idea of what systems, or subsystems, are causing the major problems. Those are the areas then that will require the most study, but all areas should be investigated to at least the depth indicated in this paper.

The forms and checklists given here are only suggestions as to the types of data that must be collected and evaluated. They are not intended to replace good judgment but only as an aid in its application to the study of solid waste systems. As knowledge within this field increases and more experience is gained, the techniques presented here will certainly be modified and expanded, but this is a beginning.

PHYSICAL HANDLING SYSTEM

Storage

Responsibility for the collection and disposal of solid waste cannot begin until the waste is placed in the designated storage area or container. The location of the storage area and the type of container used both have a marked influence on collection practices. Therefore, study of storage practices is a logical first step for any evaluation.

Solid waste from residences will differ greatly from that collected from commercial and industrial areas, etc., therefore, the origin, or source, of the waste should be determined. The type of facility using a particular storage area will also provide some indication about the characteristics of the waste, the approximate amounts, and the need for any special type of container. All of the necessary information on storage practices should be collected in as much detail as possible (Form I).

Storage, aside from influencing collection, is also the period when solid waste is most exposed and subject to vectors, fires, and disease transmission. Therefore, it is important that storage areas be inspected and evaluated so that solutions to any problems can be implemented (From II). A number of evaluations would need to be done for each type of source, the actual number depending upon the precision desired in the results and the use intended for the data.

An analysis of the data collected on storage areas may show which storage practices are unsatisfactory and in need of improvement. This may further indicate the need for ordinances governing the storage of solid waste, or the stronger enforcement of existing legislation.

Collection

Much of the information necessary for studying a collection system will be provided by Form I. Additional work is needed, however, in locating the waste sources. This can be done on a map, where pins or colored marks can be used to distinguish between different types of sources. Such a map will later be useful in choosing alternative routes for collection vehicles.

A general evaluation of the collection system is usually necessary so that its shortcomings can be identified (Form III). Specific areas will need additional study, and will be covered later.

The collection system will only operate as well as the men who staff it. Therefore, evaluation of collection personnel is a necessary part of any study. In addition to productivity records, some rating of personnel is often desirable (Form IV). This form, like Form II, is designed for use in the field under actual working conditions.

Individual evaluations should be performed on a majority of collectors as part of any study. The recurrence of "no" answers to certain questions will tend to point out inadequacies in training and supervision.

Transfer and Processing

Following the collection of solid waste, it is often transferred to larger vehicles or processed before final disposal. The predominate methods of processing are incineration, composting, compaction, and size reduction. If any of these techniques are used, they should be identified

(Form V). A brief inspection and evaluation should be made of each transfer and processing site to determine its characteristics, the quality of operation, and its acceptability in a modern system (Form VI).

Disposal

Ultimate disposal of solid waste is usually conducted on or under the ground, following any treatment or processing, by open dumping or sanitary landfilling. The number and location of all disposal sites used by the agency being studied should be listed (Form VII). The type of site should be listed as either an open dump or a sanitary landfill, with other information supplied in a manner similar to that followed in completing Form V.

An open dump is always unacceptable from a public health viewpoint, and often illegal as well. It usually is not operated, but merely exists and, therefore, cannot be evaluated in the same manner as a sanitary landfill. All open dumps should be visited, and air and water pollution and unsafe practices should be noted. A sanitary landfill will need somewhat more evaluation on the quality of its operation and its effects on the environment (Form VIII).

Two important considerations at any disposal, or processing, site are the amounts and composition of the waste received. Ideally, trucks can be weighed individually, providing information on the total amount of waste received and the number of loads delivered. Unfortunately, many facilities do not have scales and alternative methods are needed to characterize the waste.

The number of loads received can be obtained in two ways, from collection records or by recording each load as it is received at the processing or disposal site (Form IX). Information of the type gathered in Form IX should be collected daily at all sites. If this is not done routinely, it should be done specifically for study purposes. The number of days this information is gathered will depend on the manpower available for the job and the degree of accuracy needed. Consideration should also be given to the existence of seasonal variation in this data.

If volume data are available, either from collection records or from a study as outlined in Form IX, approximate weights might be obtained by the judicious use of density factors. This method is not as acceptable as actual weighing, but it could be used.

Composition data can be gathered in several ways. The most accurate way is the hand separation of waste into its various components (Form X). The nine separation categories used by the Bureau of Solid Waste Management are: food waste; garden waste; paper products; plastic, rubber, leather; textiles; wood; metals; glass and ceramics; and ash, rock and dirt. Individual samples of between 200 and 300 pounds may be separated and the percentage composition of the components calculated. Past studies have indicated that a minimum of 20 of these separations must be performed on each source of waste (residential, commercial, etc.) to adequately define its composition. Not all of these separations must be done at one time, however, but can be spread out over a season's or year's time.

If the manpower is not available for physical separation, estimates of composition can be obtained by observing the amounts of each type of waste and applying previously obtained compositions for each type. This can be done either in connection with the storage survey (Form I) or the waste inventory (Form IX).

MANAGEMENT SYSTEM

Personnel

Personnel keep a solid waste system operating and effective. A good system cannot be run without enough people who are well prepared for their jobs. A quick inventory (Form XI) of people and responsibilities is a logical starting point for the study of a management system. Additional information should also be collected on the handling of personnel. This includes a description of employee qualifications, training, supervision, working hours, and working conditions.

Equipment

Proper equipment is also necessary for the operation of an effective solid waste system. Not only must enough equipment be available, but it must be in good repair. An equipment inventory (Form XII) should be completed in order to determine what is presently available.

Maintenance on equipment should be performed routinely to insure that it is in optimum operating condition at all times. Therefore, information regarding equipment maintenance and policies should be gathered. This would include maintenance schedules, replacement policies, assignment of responsibilities for maintenance, and the procedures for reporting equipment needing repair.

The operating cost for each piece, or class of equipment should be obtained. This would normally be reported as dollars per hour or dollars per mile and should include all gas, oil, repairs (including labor), insurance, and any other cost associated with operating the equipment. This cost will not include depreciation which can be obtained from Form XII.

Facilities

Facilities are differentiated from equipment by their permanent nature and the fact that they are usually immobile. Examples of facilities are incinerators, buildings, transfer stations, and land. An inventory of all facilities used for the activities of the solid waste agency should be made (Form XIII).

The annual operating cost for each facility should be obtained. This will include all taxes, rents, utilities, repairs, etc. that contribute to the annual cost.

Financial

A discussion of financial management will include certain elements that relate to all other areas of the solid waste management system. Primarily it is an accounting of the assets and liabilities of the total system (Form XIV).

Reports and Evaluations

Record keeping should be a normal and continuing part of every solid waste management system. Often, however, this is not done and a special study or survey will be done periodically to evaluate the system. Reports prepared from these special studies, or from daily records, are valuable tools for evaluating a system. Prior reports on any aspects of the solid waste management system should be accumulated and analyzed by people hoping to improve the system. Copies of all data reporting and recording forms should also be obtained so that they may be evaluated and improved.

Legal

All local ordinances governing solid waste storage, collection, transportation, or disposal should be identified and examined for completeness and acceptability.

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FORMS

FORMS

A total of 14 forms have been developed, and are presented on the following pages. Each is designed to be used separately, but they are also interrelated so that several different forms must be completed in order to gather complete data on any component of the solid waste system.

Most of the forms are intended as inventories and must be completed only once, several, however, must be replicated in order to gain a proper perspective of the system (Table I).

TABLE I

SUMMARY TABLE OF THE FORMS GIVEN IN

A GUIDE TO THE STUDY OF SOLID WASTE SYSTEMS

Form number	Type of form	Activity related to	Number of forms to be completed
I	Inventory	Storage system	1
II	Evaluation	Storage areas	Variable*
III	Evaluation	Collection system	1
IV	Evaluation	Collection personnel	Variable+
V	Inventory	Processing and transfer systems	1
VI	Evaluation	Processing and transfer facilities	As many as there are facilities
VII	Inventory	Disposal system	1
VIII	Evaluation	Disposal sites	As many as there are sites
IX	Survey	Amounts of waste	Variable*
X	Survey	Characteristics of waste	Variable*
XI	Inventory	Total system personnel	1
XII	Inventory	Total system equipment	1
XIII	Inventory	Total system facilities	1
XIV	Evaluation	Total system finances	1

*The number of these forms to be completed can be determined using standard statistical techniques for calculating sample size.

+The number of these forms to be completed will be dependent upon the depth of study and the planned use of the data.

FORM I

SOLID WASTE STORAGE INVENTORY

Community: _____ Date: _____ Data by: _____

Source of Solid Waste (1)	Number of Units in Source (2)	Predominant Types of Containers Used (3)	Total Number of Containers (4)	Frequency of Collection (5)	Collection Agency (6)

INSTRUCTIONS: FORM I

1. Source of Solid Waste--This column should contain the type of source (i.e., residential, commercial, industrial, institutional, etc.). If it is possible to further subdivide these sources into single family homes, apartments, types of businesses, types of industries, etc., this should be done.
2. Number of Units in Source--This should enumerate the number of units of each source listed in column (1).
3. Predominant Types of Containers Used--This should include the size and construction (e.g. 32-gal, galvanized, etc.) of the predominant container types used for each source. This should also include mention of special types of collection equipment used for emptying bulk containers.
4. Total Number of Containers--The number of containers of the type given in column (3) at the sources given in column (1) should be listed in this column.
5. Frequency of Collection--This should state the number of times collection is scheduled during a specified period of time. If collection if furnished upon request, this should be labeled "as needed" and an estimate of the number of collections provided per week should be given. If collection frequency varies, this should be stated along with the schedule.
6. Collection Agency--The primary agency that provides collection service should be listed (i.e. city, county, private firm, individual, etc.).

FORM II

SOLID WASTE STORAGE EVALUATION

Community: _____ Type of Source: _____

Date: _____ Data by: _____

	Yes	No
Storage Container Evaluation--		
1. Are all containers designed for solid waste storage?		
2. Do all containers have suitable lids?		
3. Are all lids tightly in place?		
4. Are all containers in good condition and free of any openings which would admit flies and rodents when the lids are tightly in place?		
5. Are all storage containers easily cleanable?		
6. Are all storage containers of suitable size and condition to be easily handled?		
Storage Area Evaluation--		
7. Is all solid waste in suitable containers or bundled properly for collection?		
8. Is the storage area used only for solid waste?		
9. Is the storage area free of litter?		
10. Is the storage area free of obvious signs of vectors?		
11. Is there any evidence of open burning in the storage area?		

INSTRUCTIONS: FORM II

1. Self-explanatory.
2. Self-explanatory.
3. Self-explanatory.
4. Self-explanatory.
5. All reuseable containers must be free of recesses in which solid waste may accumulate and make cleaning difficult.
6. All containers must be capable of being handled by the intended personnel and equipment.
7. Self-explanatory.
8. Self-explanatory.
9. Self-explanatory.
10. Self-explanatory.
11. Self-explanatory.

FORM III

EVALUATION OF SOLID WASTE COLLECTION SYSTEM

Community: _____ Date: _____ Data by: _____

	Yes	No
Personnel:		
1. Is there employee screening to insure adequate physical and mental capabilities of collectors?		
2. Are periodic evaluations performed on collectors by supervisory personnel?		
3. Is there a period of training for new employees in collection procedures and public relations?		
4. Is continuing training provided in collection procedures and public relations?		
5. Are all employees given initial and periodic training in work safety and sanitation?		
Equipment and Facilities:		
6. Are drinking water facilities available for collection personnel?		
7. Are toilet and handwashing facilities available for collection personnel?		
8. Are locker and shower facilities provided for collection personnel?		
9. Are radio communications between collection vehicles and base office provided?		
10. Is all equipment in the collection system of the proper size, design, and method of operation for the materials handled? How many vehicles are not? _____		

FORM III (Cont'd)

	Yes	No
11. Are all vehicles required to pass road worthiness inspections? How frequently? _____		
12. Are all vehicles maintained in a visibly acceptable condition?		
13. Is there an adequate number of vehicles in the collection system to operate unaffected by normal extremes in weather, volume or maintenance problems?		
Operation:		
14. Are daily records kept of:		
a. crew activities?		
b. service requests and complaints?		
c. vehicle maintenance?		
d. accidents?		
e. weight of waste collected?		
f. volume of waste collected?		
15. Are the records indicated in Item 14 used for routine evaluation and revision of the collection system?		
16. Are definite daily routes assigned?		

FORM IV

EVALUATION OF SOLID WASTE COLLECTION PERSONNEL

Community:_____ Employee:_____ Date:_____ Data By: _____

	Yes	No
1. Does the employee appear to be familiar with the equipment used?		
2. Does the employee appear to be familiar with the area serviced?		
3. Does the employee work in cooperation with other crew members so as to minimize delays?		
4. Does the employee work in a smooth and rhythmic manner?		
5. Does the employee appear to work freely and without resentment?		
6. Does the employee appear to work at an acceptable rate?		
7. Does the employee appear to work at a rate that can be maintained?		
8. Does the employee appear to work at a consistent rate?		
9. Does the employee exercise care in protecting his personal safety and that of his fellow workers?		
10. Does the employee exercise care to keep from spilling waste?		
List any additional observations (weather, equipment failure, interferences, etc.) that may have influenced the employee during this period.		

FORM V

SOLID WASTE PROCESSING AND TRANSFER FACILITY INVENTORY

Community:_____ Date: _____ Data by: _____

Location of Facility (1)	Type of Facility (2)	Types of Waste Accepted (3)	Amount of Waste Accepted Per Day (4)	Year Constructed (5)	Operated by (6)

INSTRUCTIONS: FORM V

1. Location of Facility--The area or address of each facility.
2. Type of Facility--Designation such as multiple chamber incinerator, on-site incinerator, transfer station, etc.
3. Types of Waste Accepted--List as residential, commercial, industrial, demolition, construction, etc. If more than one type of waste is accepted, list each type and include relative percentages of each if possible.
4. Amount of Waste Accepted Per Day--List as ton or cubic yards and note if this is a measured or an estimated quantity.
5. Year Constructed--Self-explanatory.
6. Operated by--Self-explanatory.

FORM VI

SOLID WASTE PROCESSING AND TRANSFER FACILITY EVALUATION

Community: _____ Site: _____ Date: _____ Data by: _____

	Yes	No
1. Is there an all-weather access road, negotiable by loaded collection vehicles, provided to the entrance of the facility?		
2. Is there adequate on-site parking for vehicles waiting to unload?		
3. Are facilities provided for plant personnel:		
a. drinking water?		
b. toilet?		
c. handwashing?		
d. lockers?		
e. showers?		
4. Are there scales in use at the facility for weighing collection vehicles?		
5. Are telephone or radio communications provided at the facility?		
6. Is there adequate fire protection and fire fighting equipment available at the facility?		
7. Are daily operational records kept of:		
a. labor?		
b. equipment usage?		
c. amounts of waste?		
d. expenditures?		
8. Is routine maintenance performed on equipment?		
9. Is all solid waste confined to the dumping area within the building?		
10. Is the facility maintained free of litter?		

FORM VI (Cont'd)

	Yes	No
11. Is the unloading area large enough to accommodate enough trucks so that traffic tie-ups are minimized?		
12. Is scavenging prohibited at the facility?		
13. Is open burning prohibited at the facility?		
14. Is vector control provided at the facility?		
15. Is dust control needed?		
16. Is dust control provided?		
17. Is noise at a confortable level?		
18. Is adequate lighting and ventilation provided?		
Incinerators Only--		
19. Does the furnace have temperature controls and monitors?		
20. Do records indicate the maintenance of temperatures above 1500 F in the secondary combustion chamber?		
21. Are residue and fly ash disposed of in an acceptable manner? How? _____		
22. Are quenching and scrubbing wastes disposed of in an acceptable manner? How? _____		
23. Are air pollution control devices installed? What devices? _____		
24. Are air pollution control devices in operation?		
25. Do gaseous and particulate emissions meet applicable standards?		
26. What standards are used? _____		

FORM VI (Cont'd)

Site operated by? _____

Site owned by? _____

Site regulated by? _____

Rated capacity (T/24 hr)? _____

Average daily input (tons)? _____

Number of employees? _____

Number of shifts? _____

Hours of Operation? _____

Days of Operation? _____

Surrounding land use? _____

Loads per day received? _____

Number of furnaces? _____

Method of charging? _____

Type of grates? _____

Additional Comments:

FORM VII

SOLID WASTE DISPOSAL SITE INVENTORY

Community: _____ Date: _____ Data by: _____

Location of Disposal Site (1)	Type of Disposal Site (2)	Types of Waste Accepted (3)	Amount of Waste Accepted Per Day (4)	Owned by (5)

FORM VIII

LAND DISPOSAL EVALUATION

Community:_____ Site:_____ Date:_____ Data By:_____

	Yes	No
1. Is there an all-weather access road, negotiable by loaded collection vehicles, provided to the entrance of the site?		
2. Are scales in use at the landfill for weighing collection vehicles?		
3. Are any other methods of measurement used? If so, state what they are: _____		
4. Are facilities provided for personnel:		
a. drinking water?		
b. toilet?		
c. handwashing?		
d. lockers?		
e. showers?		
5. Are telephone or radio communications provided at the site?		
6. Is there adequate water available for fire control? If not, what provisions have been made to combat fires?_____		
7. Is scavenging prohibited?		
8. Is the landfill fenced to exclude animals and unauthorized persons?		
9. Is the unloading of waste controlled?		
10. Is the working face kept as small as possible for the equipment used and the number of trucks received?		
11. Are provisions made to confine blowing litter?		
12. Is the solid waste spread in shallow layers, not exceeding two feet, and then compacted?		

FORM VIII (Cont'd)

	Yes	No
13. Is all waste covered each day with sufficient compacted soil to prevent insect and rodent attraction?		
14. Are facilities available for equipment maintenance?		
15. Is back-up equipment available in case of prolonged inoperation of major equipment?		
16. Have provisions been made for handling bulky or hazardous materials? If so, what? _____		
17. Is burning prohibited at the landfill site?		
18. Is vector control provided as needed?		
19. Is dust control provided as needed?		
20. Is the waste placed above the ground water table?		
21. Are provisions made for control or diversion of surface water?		
22. Is feeding of domestic animals prohibited at the landfill?		
23. Are daily operational records kept of: a. labor? b. equipment usage? c. amounts of waste? d. expenditures?		
24. Has a plan been prepared for operation and use of the landfill site?		
25. Is the plan being followed?		

FORM VIII (Cont'd)

Site operated by?_____

Site owned by?_____

Site regulated by?_____

Character of site (gully, canyon, etc.)?_____

Year operation began?_____

Years of life remaining?_____

Total area of site (acres)?_____

Ultimate use?_____

Frequency of cover?_____

Number of loads/day?_____

Number of tons/day?_____

Cubic yards/day?_____

Type of equipment?_____

Number of employees?_____

Hours of operation?_____

Days of operation?_____

Additional comments:_____

FORM IX

AMOUNT OF SOLID WASTE INFLUENT TO PROCESSING, TRANSFER, OR DISPOSAL FACILITY

Site: _____ Date: _____ Data by: _____

Load No.	Type of Vehicle (1)	Source of Waste (2)	Type of Waste (3)	Weight of Waste (lb)(4)		Volume of Vehicle (cu yd) (5)	Amount of Waste (6)			
				Gross / Tare	Net		1/4 full	1/2 full	3/4 full	full
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

INSTRUCTIONS: FORM IX

1. Type of Vehicle--Designated as packer, dump truck, private auto, etc. Indication of ownership and vehicle number would be helpful for fleet operations.
2. Source of Waste--Used primarily for single source bulk containers. Collection area can be indicated for vehicles collecting more than one service.
3. Type of Waste--Listed as residential, commercial, construction, etc. Relative percentages of waste in mixed loads would also be helpful.
4. Weight of Waste--Recorded from a scale.
5. Volume of Vehicle--The waste carrying capacity of the vehicle (cu yd).
6. Amount of Waste--An estimate of how full the vehicle is with waste.

FORM X

SOLID WASTE CHARACTERIZATION

Community: _____ Source of Waste: _____

Data: _____ Data By: _____

Sample Number: _____

Component	Weight (lb)	Percent of Total
(1) Food Waste		
(2) Garden Waste		
(3) Paper Products		
(4) Plastic, Rubber, Leather		
(5) Textiles		
(6) Wood		
(7) Metals		
(8) Glass and Ceramics		
(9) Ash, Rock, Dirt, etc.		
Total		
Moisture Content (%) _____ (as-received basis)	xxxxxxxx	xxxxxxxxxx

INSTRUCTIONS: FORM X

The guiding principle behind the separation is to obtain groups of materials having similar physical and chemical properties. Appropriate care should be taken to place each item into the correct category, but it is not worthwhile to attempt to separate labels from cans or other similar minute divisions. Such materials should be placed in the category which most closely fits their major weight classification.

1. Food Waste--That waste resulting from food preparation, primarily putrescibles.
2. Garden Waste--Yard trimmings, leaves, and brush. Twigs and branches are included in this category if they have diameters of less than 1 in.
3. Paper Products--Wrapping paper, newspaper, cardboard, and other similar items.
4. Plastics, Rubber, Leather--Plastic film, packaging, and rubber and leather items.
5. Textiles--Natural and synthetic fabrics.
6. Wood--Wood or wood products with diameter in excess of 1 in.
7. Metals--Both ferrous and nonferrous metals. This is primarily cans, with some wire, metal foil, and heavy, bulky items.
8. Glass and Ceramics--Mostly bottles and jars, but includes noncombustible ceramic materials.
9. Ash, Rocks, Dirt--This category receives everything which cannot be put in one of the other eight categories. Materials are noncombustible and include those of such a small size that they cannot be separated into another category.

FORM XI

PERSONNEL INVENTORY

Community: _____ Date: _____ Data by: _____

Name of Employee (1)	Job Title or Description (2)	Level, Grade, Rank, etc. (3)	Yearly Salary (4)	Age (5)	Number of Years with Activity (6)

INSTRUCTIONS: FORM XI

1. Name of Employee--Each employee (full or part time) who works directly for the agency responsible for solid waste should be listed.
2. Job Title or Description--Each employee's duties should be identified as collector, driver, secretary, etc.
3. Level, Grade, Rank, etc.--To be used for personnel under a civil service or similar system.
4. Yearly Salary--Yearly salary exclusive of fringe benefits. For part time and shared personnel, report only the amount of salary paid by the solid waste agency and indicate this condition.
5. Age--The ages of each employee should be listed.
6. Number of Years with Activity--The total number of years the employee has been with the solid waste agency.

FORM XII

EQUIPMENT INVENTORY

Location: _____ Date: _____ Data by: _____

Type of Equipment (1)	Capacity or Size (2)	Model Number (3)	Model Year (4)	Manufacturer (5)	Date of Purchase (6)	Purchase Price (7)	Total Estimated Life (8)

INSTRUCTIONS: FORM XII

1. Type of Equipment--All equipment should be listed as packer truck, pickup, sedan, bulldozer, etc.
2. Capacity or Size--Collection vehicle capacity in cubic yards or a similar listing for other types of equipment.
3. Self-explanatory.
4. Self-explanatory.
5. Self-explanatory.
6. Self-explanatory.
7. Self-explanatory.
8. Self-explanatory.

FORM XIII

FACILITIES INVENTORY

Community: _____ Date: _____ Data by: _____

Type of Facility (1)	Location (2)	Use (3)	Year Constructed (4)	Capital Cost (5)	Estimated Life Remaining (6)

INSTRUCTIONS: FORM XIII

1. Type of Facility--Listed as building, land, incinerator, etc.
2. Location--Identified so as to be unique.
3. Use--The present use of the facility as office, incinerator, landfill, idle, etc.
4. Year Constructed--This would also be the year land was purchased for use as a landfill.
5. Capital Cost--Estimated capital cost. List the cost and year of any remodeling and additions to original facility.
6. Estimated Life Remaining--Number of years remaining before replacement is needed.

FORM XIV

FINANCIAL EVALUATION

Community: _____ Date: _____ Data by: _____

	Present Year to date	Last Year	Previous Year
Personnel:			
Collection			
1. Direct wages			
2. Fringe benefits (insurance, pension, etc.)			
Processing and Transfer			
3. Direct wages			
4. Fringe benefits			
Disposal			
5. Direct wages			
6. Fringe benefits			
Management and Support Services			
7. Direct wages			
8. Fringe benefits			
9. Cost of contracted services (maintenance, payroll, etc.)			
Equipment:			
Collection			
10. Annual amortization or rental cost			
11. Total capital cost (collection vehicles, pickups, etc.)			
12. Total operating cost			
a. Fuel, oil, etc.			
b. Parts and supplies			
c. Cost of contracted repairs			
d. Insurance			

FORM XIV (Cont'd)

	Present Year to date	Last Year	Previous Year
Processing and Transfer			
13. Annual amortization or rental cost			
14. Total capital cost (bull-dozers, trucks, etc.)			
15. Total operating cost			
a. Gas, oil, etc.			
b. Parts and supplies			
c. Cost of contracted repairs			
d. Insurance			
Disposal			
16. Annual amortization or rental cost			
17. Total capital cost (bull-dozers, trucks, etc.)			
18. Total operating cost			
a. Gas, oil, etc.			
b. Parts and supplies			
c. Cost of contacted repairs			
d. Insurance			
Management and Support Services			
19. Total capital cost			
20. Total cost of expendable items			
Facilities:			
Collection			
21. Annual amortization or rental cost			
22. Total capital cost (garage, shop, etc.)			
23. Total operating cost			
a. Gas and electricity			
b. Water			
c. Telephone			
d. Other Utilities			
e. Insurance			

FORM XIV (Cont'd)

	Present Year to date	Last Year	Previous Year
Processing and Transfer			
24. Annual amortization or rental cost			
25. Total capital cost (buildings, furnaces, etc.)			
26. Total operating cost			
Disposal			
27. Annual amortization or rental cost			
a. Gas and electricity			
b. Water			
c. Telephone			
d. Other utilities			
e. Insurance			
28. Total capital cost (land, sheds, etc.)			
29. Total operating cost			
a. Gas and electricity			
b. Water			
c. Telephone			
d. Other utilities			
e. Insurance			
Management and Support Services			
30. Annual amortization or rental cost			
31. Total capital cost (buildings, offices, etc.)			
32. Total operating cost			
a. Gas and electricity			
b. Water			
c. Telephone			
d. Other utilities			
e. Insurance			
Reports and Evaluation:			
33. Annual cost of surveys, studies, etc.			
34. Annual cost of reports			

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